



@LostInBritanny
@PierreZ
@AurrelH95

Rediscover the known Universe with NASA dataset



#DevfestLille

@OVHMetrics



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Pierre Zemb

@PierreZ

Software Engineer working
on distributed systems



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@OVHMetrics



Aurélien Hébert



@AurrelH95

Software Engineer and data
lover



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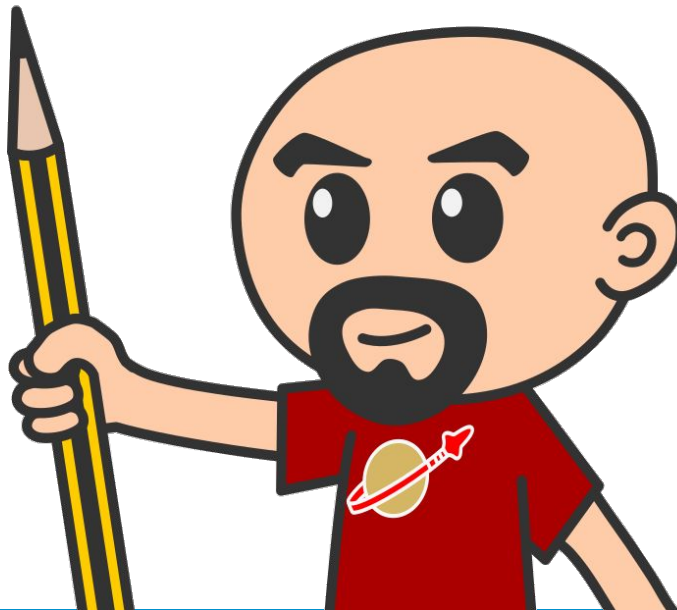
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Horacio Gonzalez

@LostInBrittany

Spaniard lost in Brittany, developer,
dreamer and all-around geek



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Looking for exoplanets in NASA datasets

HelloExoWorld

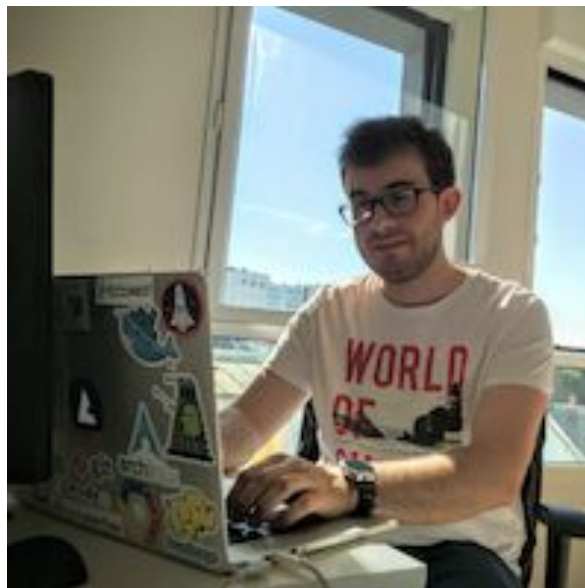
Once upon a time...



An amateur astronomer



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Pierre Zemb, DevOps OVH



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What not to do if you love astronomy



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Live in Brest



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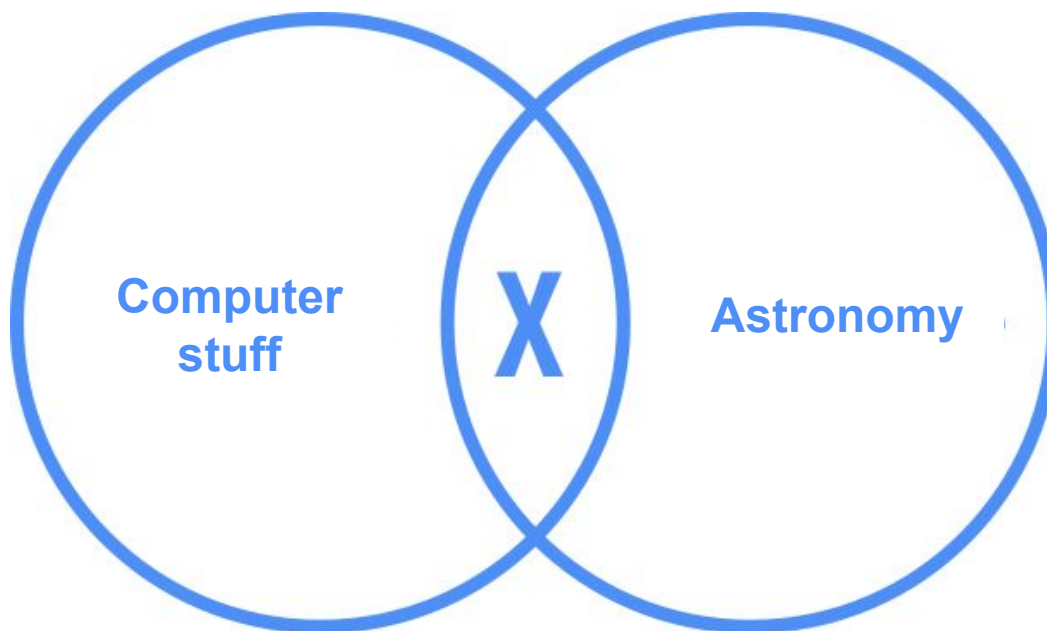


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Looking for solutions



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Mixing passions



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Google is your friend...



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time series astro

time series **astronomy**

time series **analysis in astronomy limits and potentialities**

astroml.time series

astronomical time series **analysis**

random time series **in astronomy**

astrophysical time series

Google Search

I'm Feeling Lucky

[Learn more](#)

Report inappropriate predictions

Let's find a project



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Exoplanets?



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Planets orbiting stars far away



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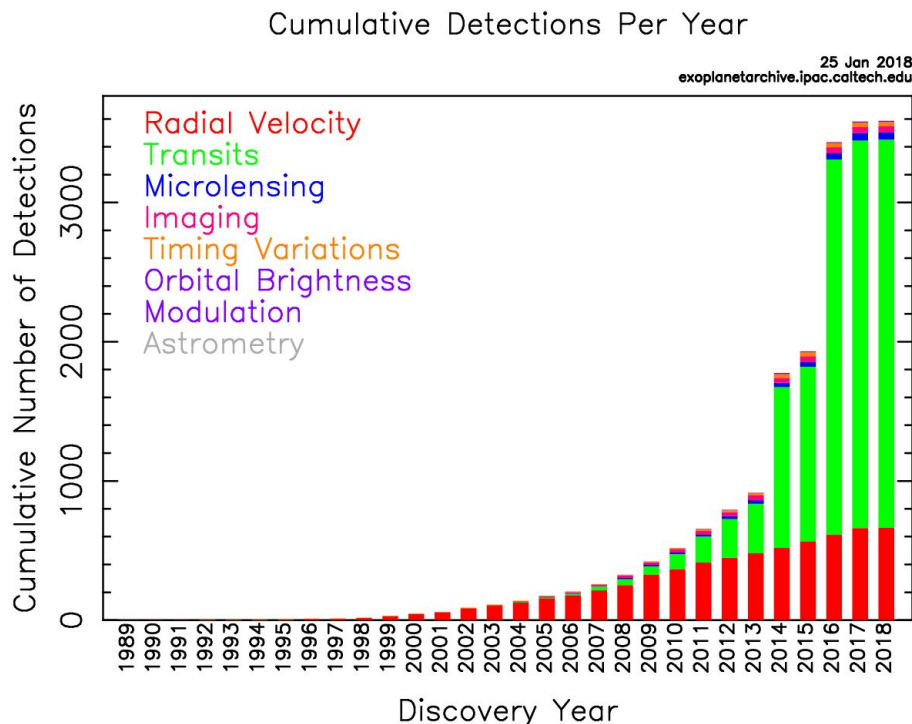


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How do we find them?



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The transit method seems the best



The transit method



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Credits: NASA's Goddard Space Flight Center

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How do we look for transits?



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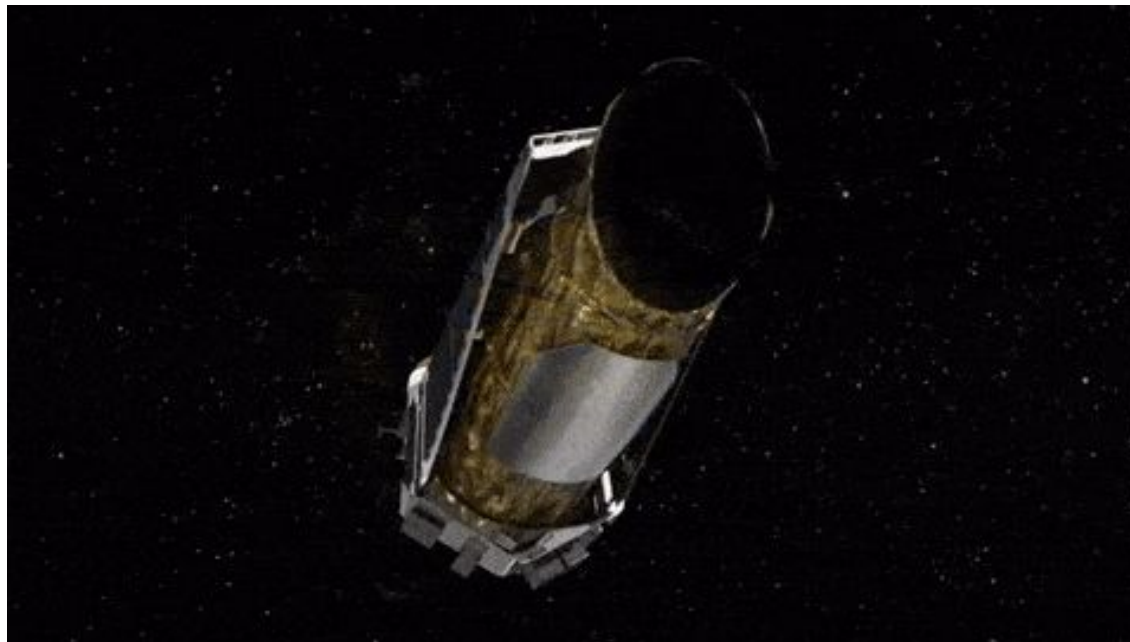


Image credits : NASA

Kepler



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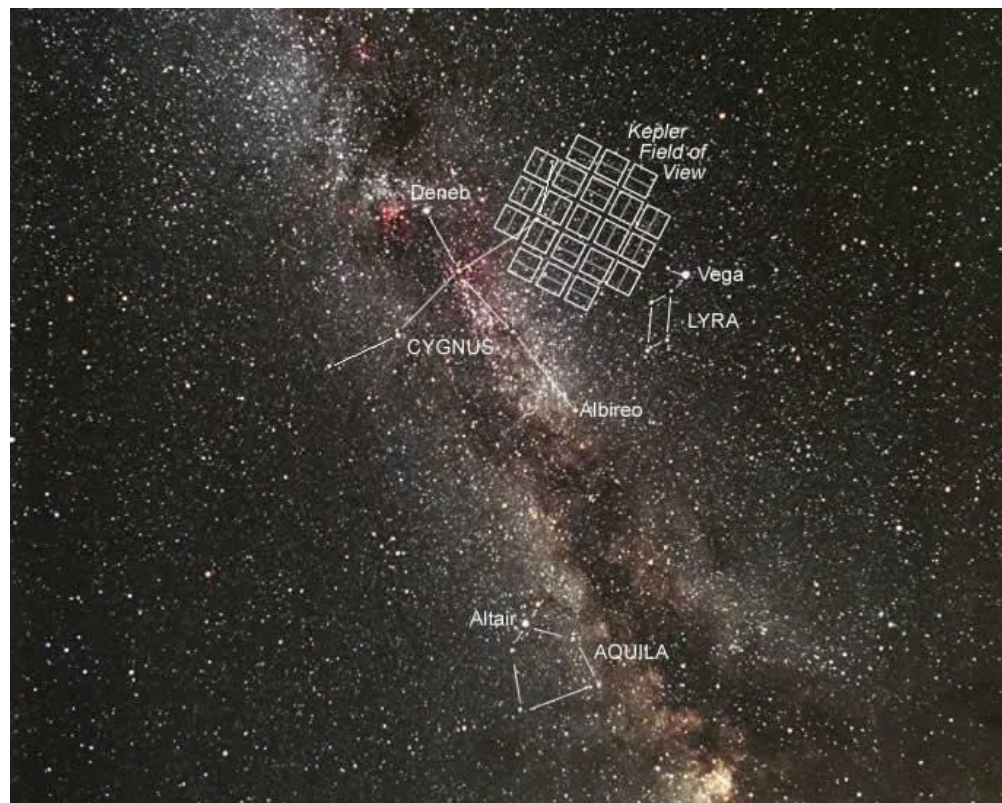
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Watching the sky



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By Carter Roberts [Public domain], via Wikimedia Commons



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And what kind of data we get?



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Pleiades By NASA, ESA, AURA/Caltech, Palomar Observatory. Via Wikimedia Common



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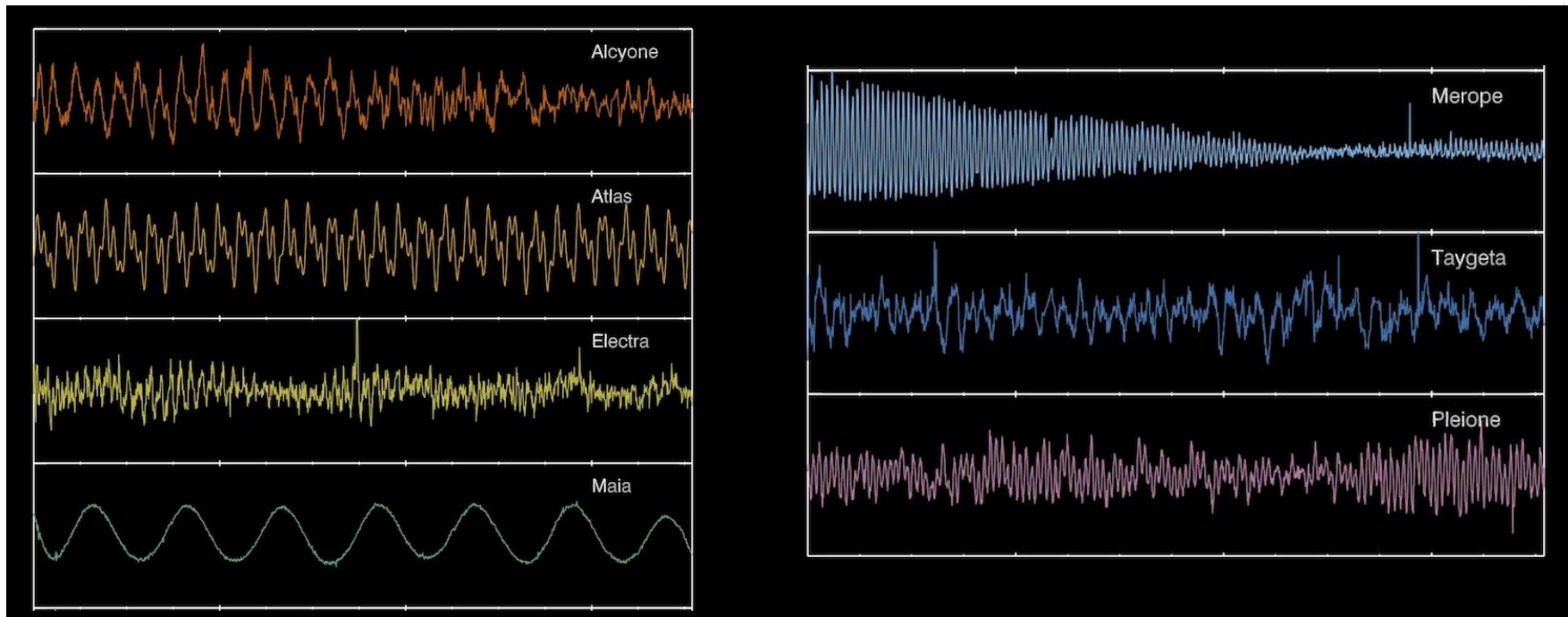


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Well, that's the problem



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Seven stars, seven different profiles



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Kinda big data



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Ben Montet
@benmontet

Following



The full [@NASAKepler](#) dataset (Kepler + K2) is ~25 TB in size. For comparison, the entire archive of the [@librarycongress](#) is 15 TB.

7:54 PM - 3 Mar 2017

7 Retweets 15 Likes



3



7



15



Over 40 million light curves



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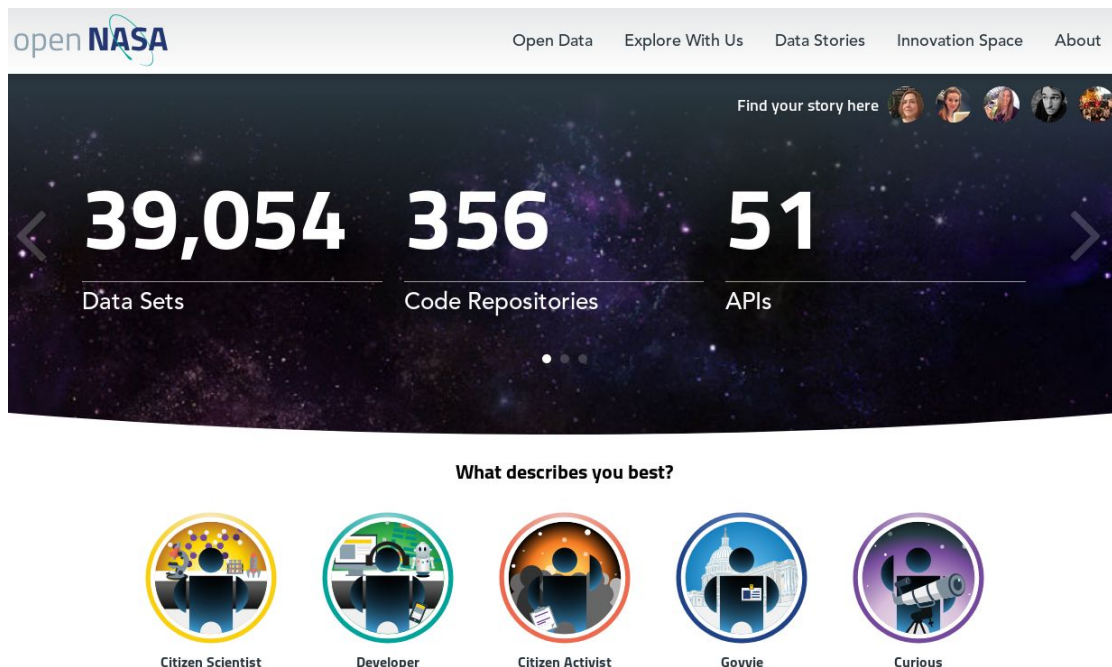


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Big AND open data



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Lots of datasets in #opendata



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And we can help with that!



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Let's use our tools to analyse the data



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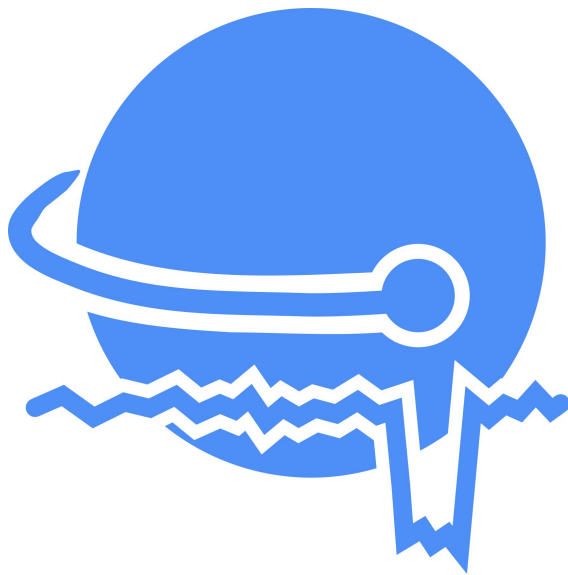
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Time Series

To analyse Kepler datasets



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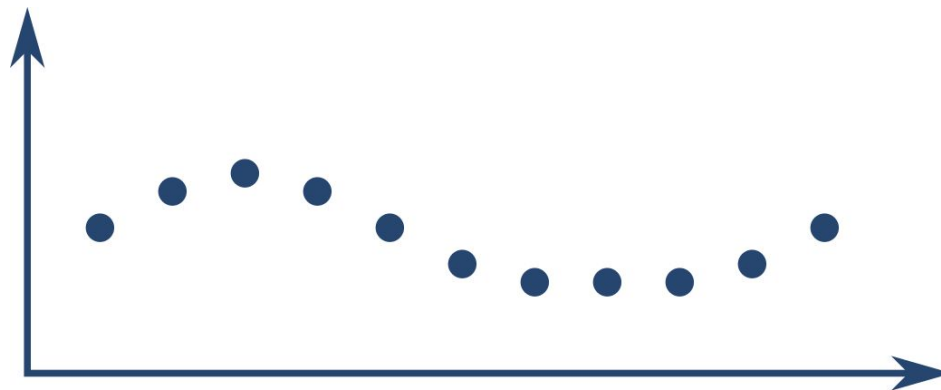
Kepler: spatial Time Series



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Definition of Time Series:

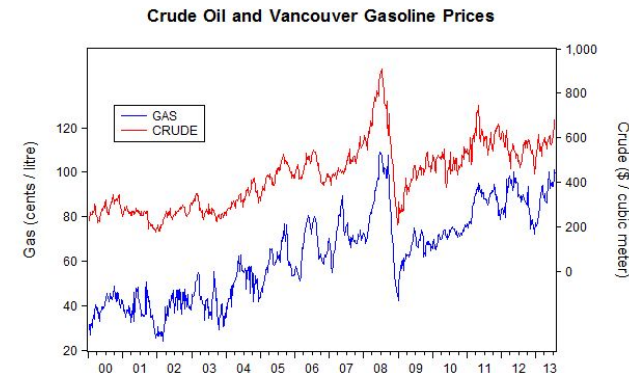
A series of data points indexed in time order



Time Series



- Stock Market Analysis
- Economic Forecasting
- Budgetary Analysis
- Process and Quality Control
- Workload Projections
- Census Analysis
- ...



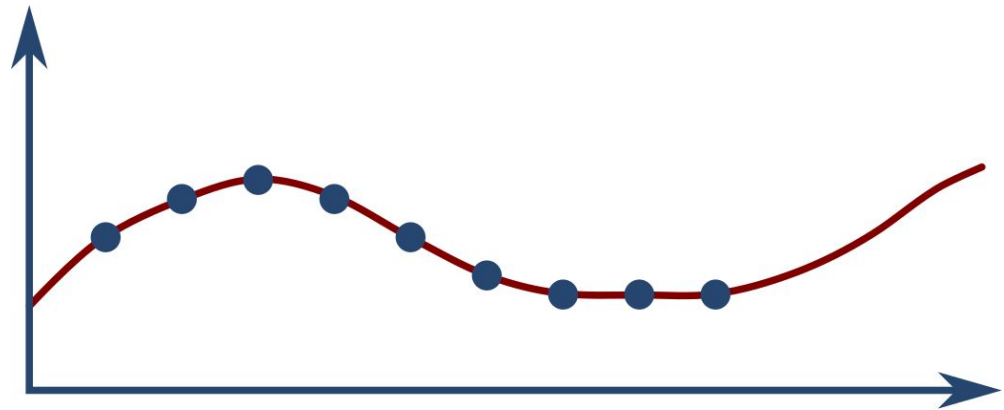
Time Series



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Applications:

- Understanding the data
- Fit a model
 - Monitoring
 - Forecasting



Time Series



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Stock market Analytics
Economic Forecasting



\$\$\$



Study & Research

Many specific analytical tools:

- Moving average
- ARMA (AutoRegressive Moving Average)
- Multivariate ARMA models
- ARCH (AutoRegressive Conditional Heteroscedasticity)
- Dynamic time warping
- ...



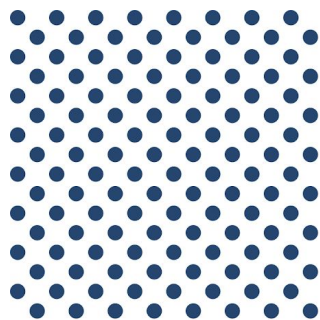
Specific application of general tools

- Artificial neural networks
- Hidden Markov model
- Fourier & Wavelets transforms
- Entropy encoding
- ...

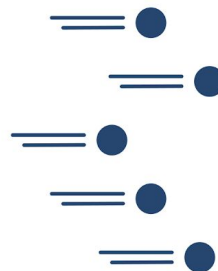
Dealing with Time Series



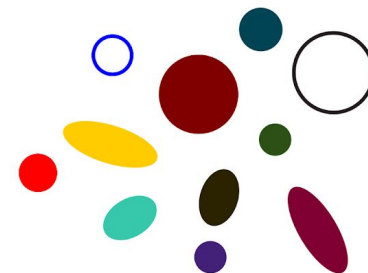
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Volume



Velocity



Variety

The 3 'v'



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Metrics Data Platform



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Some of Metrics' metrics:

- 1.5M datapoints/s, 24/7
- Peaks at ~10M datapoints/s
- 500M unique series



Tools to deal with Time Series



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Many options



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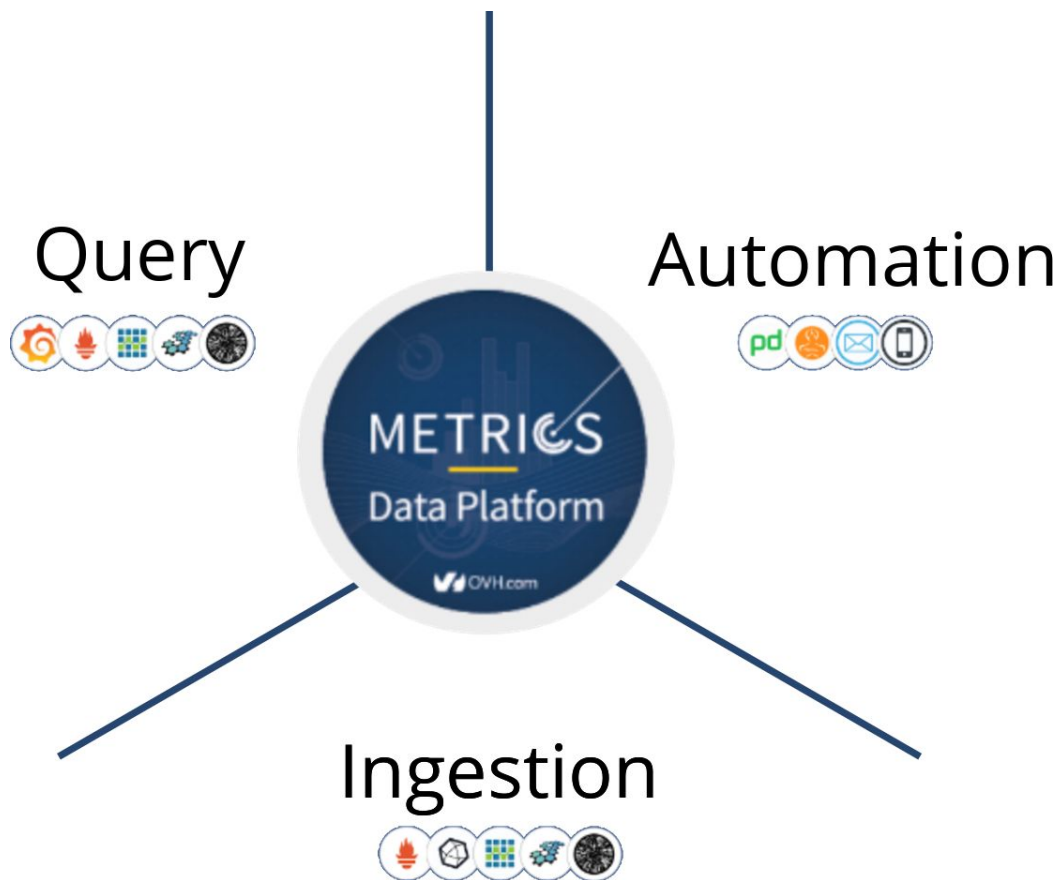


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Metrics Data Platform



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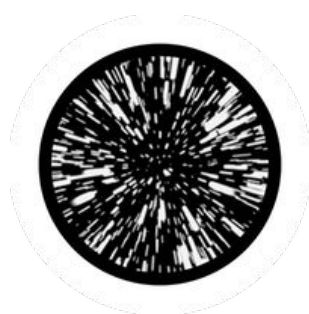
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Metrics Data Platform



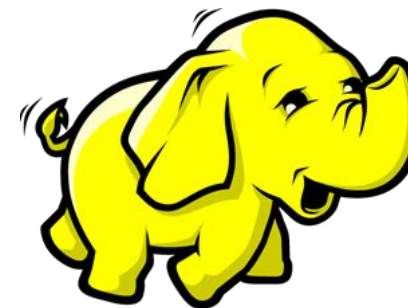
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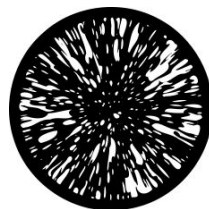
Why Warp 10?



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Warp 10 is a software platform that

- Ingests and stores time series
- Manipulates and analyzes time series



WARP 10



Analytics is the key to success



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Fetching data is only the tip of the iceberg



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A true Time Series analysis toolbox

- Hundreds of functions
- Manipulation frameworks
- Analysis workflow



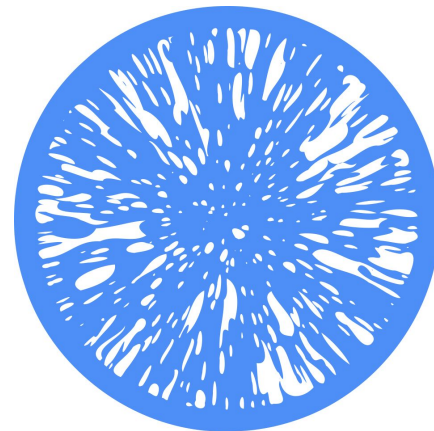
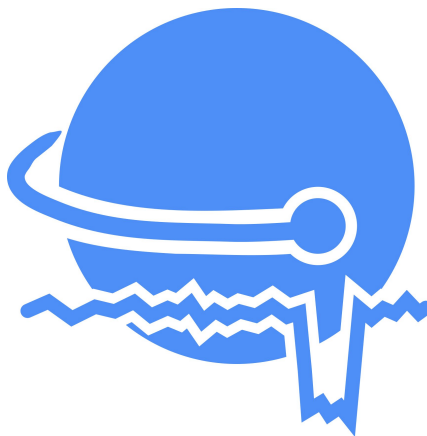


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A match made in heaven

Warp 10, OVH Metrics and HelloExoWorld

METRICS



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What we have done



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- Downloaded and parsed 40 millions of FITS files
- Pushed it to OVH Metrics
- Select a cool subset as training set
- Verified we could find the same planets as NASA



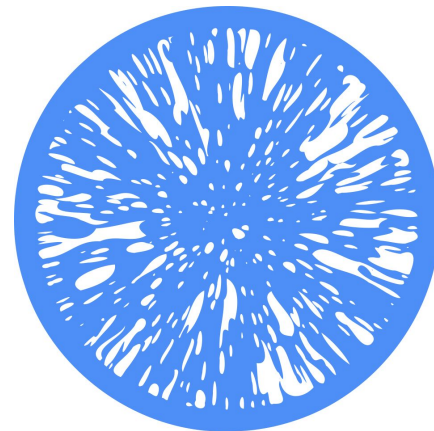
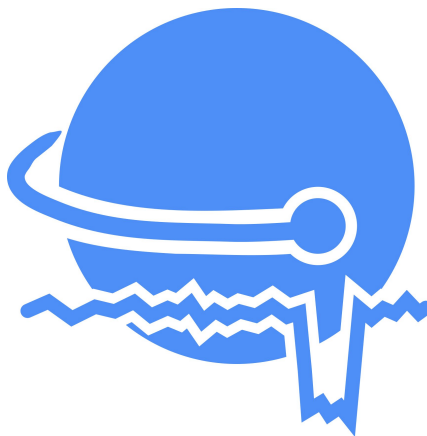


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METRICS



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Let's get started!



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1. Connect to <https://bit.ly/2H7Z5b3>

or

Connect to WIFI HEW-5G (or HEW)

2. Password is helloexoworld
3. Click on cancel on user password window
4. Open chrome/chromium on 192.168.1.2

Reach step 2.2 and enjoy!



What's next?

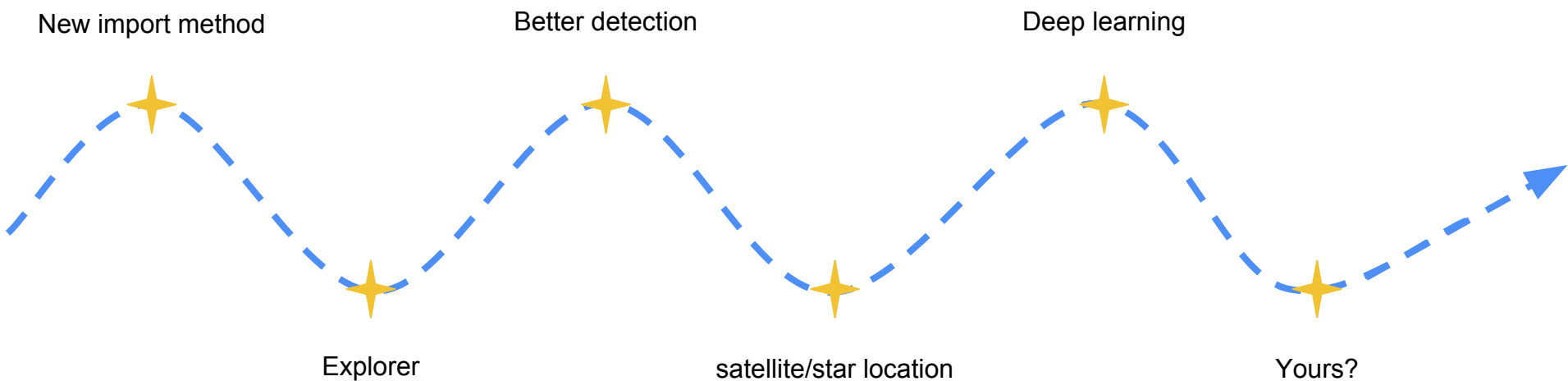
Where do we go from here?



Only the beginning



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A growing team



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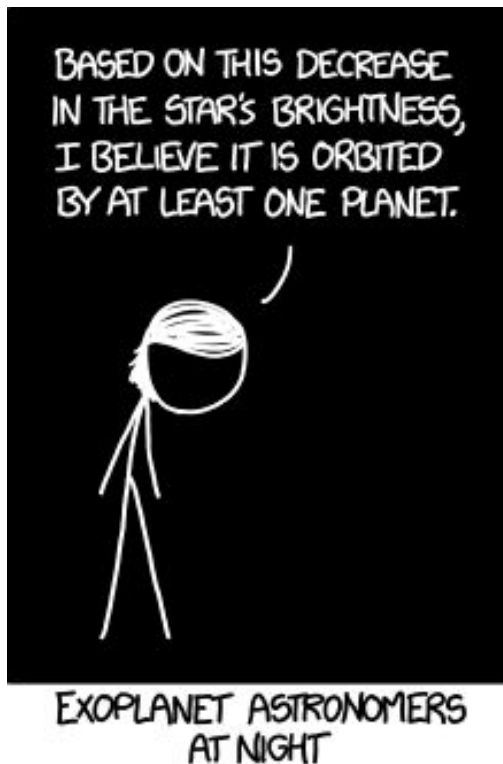
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And you!



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<https://xkcd.com/1371/>

Join us!

<https://helloexo.world>



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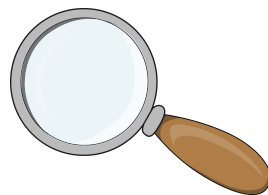
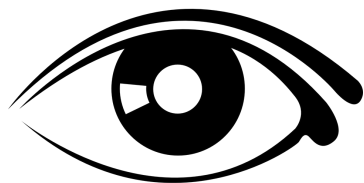


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Metrics milestone



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